



Charlotte Mason's House of Education,  
Scale How, Ambleside, UK, 2009

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have never forgotten some impassioned words of George Macdonald's on this subject, in a lecture which he gave twenty years ago on *King Lear*. They were to this effect:—"Lear's soul had not grown to what it was meant to be, and so all the growth had to be compressed through fearful sufferings into a few short weeks at the end of his life. That is always torture. The soul is meant to be growing and deepening through a whole lifetime. That is why so many days are portioned out to each of us. Nothing is more horrible than the outside of a man or woman, a lovely form, with its soul within not grown up in proportion. It sometimes seems as if such a person's soul must rattle like a dried pea inside them. It is so shrunk from what it was meant to be in such a casket. It is rather like what we have heard of some *nouveaux riches* who build themselves palaces, and then for very comfort's sake go and sit in the kitchen. Each of us is given a glorious palace to inhabit, with such a library, such a lovely picture gallery, such music and harmony and beauty all around, and a glimpse of heaven itself if we open the window,—and yet some of us go and live in the coal cellar! all our lives, too, making prisoners of our souls till they grow idiotic and blind for very want of food and light."

We should pray for guidance in this great work of training the souls of the children, these wonderful gifts of God to us.

## THE PHYSIOLOGY OF EDUCATION.

BY J. STRACHAN, M.D.

A FEW years ago a parliamentary commission, appointed to investigate into alleged prevalence of over-pressure in English schools, reported that a number of cases of serious illness, and some of actual death, had undoubtedly been caused directly by school work. Most of us could point to similar cases, which may well be regarded as very extreme, and are to be estimated, not by their number but by their significance, as indicating a certain tendency in school life. There are many degrees of injury short of death. The occurrence of even one death or serious illness, caused directly by school work, is sufficient to stamp that work as in some way inconsistent with the laws of health, and to suggest the existence of much evil in connexion with it, which may never come to the knowledge of the public. In medical practice we have all frequent occasion to observe close relation between prize taking at school and pale cheeks, poor appetite, headaches, sleeplessness, and other indications of deteriorated health, with a tendency to nervous affections at the time or in later years. These and other facts which might be mentioned fully justify the inference that school procedure runs upon unsafe lines, and that the danger to the pupils is in proportion to the pressure under which it is driven.

If we seek an explanation of such a state of matters we may find it sufficiently indicated by Prof. Bain, of Aberdeen, in his book *Education as a Science*. In that book of 438 pages the "Bearings of Physiology" are disposed of in less than three pages. In these we find the following passages:—"The Science of Physiology . . . . is quite distinct from the process of education." "The art of Education assumes a certain average physical health; and does not inquire into the means of keeping up or increasing that average." "The inquiry must proceed upon our direct experience in the work



of education; with an occasional check or caution from the established physiological laws." The assumption here is that education has to do with something apart from, or only loosely associated with, our physical being, which is looked upon rather as a hindrance by "occasional checks" of the kind I have just referred to, than as having any direct bearing upon the work. It is scarcely necessary to point out that, apart from moral training, education has to do entirely with brain action, which is as purely physical as is the action of any other organ of the body. It is the result of physical growth and development, is kept up by nutrition and blood change in the part, is subject to fatigue, and is directly affected by injury and disease. Instead, therefore, of physiology being distinct from education, it is the basis upon which all true and safe educational procedure must rest. It is true and may be right that the teacher does not inquire into the means of keeping up the health of his pupils, just as the builder may not trouble himself about the principles of architecture upon which his plan is drawn. It is essential, however, that the builder's plan be correctly drawn upon sound principles, otherwise his work is certain to prove a failure and a danger. The medical profession, as the only recognised authorities in physiological law, are or ought to be in the position of architects in educational procedure, and it is for them to lay down the plan upon which the practical educationist may work with safety. If they neglect this duty, it is certain to be neglected, as no one else is in a position to take it up, and responsibility for educational failure and disaster may be held to rest upon their shoulders.

Whatever views may be held with regard to the abstract principle of mind which it is the special province of education to cultivate, there can be no doubt of the fact that mental action is entirely dependent upon the mechanism and functional power of the brain. The primary object of education must, therefore, be to secure a well-grown, well-developed, healthy, and vigorous brain as the foundation upon which to rear a well-furnished and well-trained mind. If there were really any antagonism between these two objects, which there is not, the former ought to have the preference. A strong, healthy brain will do much to educate itself, and will be thoroughly effective so far as its knowledge

goes; whereas a weak, ill-developed brain will be weak in thinking power, however stuffed it may be with verbal learning.

The first point to be considered with regard to the brain of the child is that it is immature. From the embryo it has made enormous strides in growth and development, and at the commencement of school life has advanced a long way in knowledge and intelligence. It is yet, however, far from complete, and the processes of growth and development, along with the acquisition of knowledge and ideas, are still actively going on. Upon these must entirely depend ultimate brain power as applied in mental action; and it is to them, as the physiological basis of education, that I wish especially to direct your attention.

Growth is a continuous process, and to attain to the highest results it must go on smoothly and uninterruptedly from birth to maturity. It no doubt varies considerably at different times, but each day and each hour adds its special increment to the growing organism. The ultimate result is the complement of each day's addition during the period required to complete the human frame. This period has a certain *fixed* limit, when no further addition can be made. For complete growth every hour up to this point must be fully utilized, and any interruption of the process is so much deducted from ultimate size and strength. In the transverse section of a tree we can examine, in the concentric circles caused by the winter's cessation, the result of each year's growth. A cold, unfavourable season is indicated by a thinner circle, which is a curtailment to the same extent of the ultimate size of the tree. A similar evidence of defective growth may be seen in the part of the finger nail which has grown during a severe illness, and which is distinctly thinner than the rest, forming a mark of value sometimes in a medico-legal sense. A like defective growth causes the hair to break off by the part which has grown during an illness, when it is supposed to be coming out. So in the whole animal or vegetable organism growth is at all times in accord with the conditions, favourable or otherwise, under which it takes place, and the final result corresponds with the sum of such conditions. Defective nail growth is in time cut off and got rid of, and the hair grows again. It is not so with the



brain. Defective growth there means, as in the tree, curtailment of ultimate size, inappreciable by our senses, but having its effect upon the mental powers.

But size, as we know, does not necessarily mean strength, and something more is required than mere growth. Concurrently with growth another process goes on in the young, which we may call functional development. This gives functional vigour and stamina to organs which otherwise, although large, might be feeble and languid in their action. It is essentially a process of youth—spontaneous, continuous, and progressive during the whole preparative stage. Along with growth it determines the ultimate attainable strength of the mature organ. For complete development every day must add its full quota to the growing organ, and anything short of this is so much detracted from the final result. A primary object in true education must thus be to maintain, continuously, and in the highest degree possible, the conditions necessary for healthy growth and development. Let us now consider what these conditions are.

First must be placed the maintenance of full health and vigour of the system. The animal body is a typical commonwealth, where each part performs its own special work in the vital economy, where all work together for the welfare of the whole, and where one cannot suffer without all being more or less affected. Much as it may be our object to pay special attention to the brain, we must not the less, but the more attend to the healthy action of all the organs of the body, without which the brain cannot thrive. A factor of great importance in education is abundance of free and hearty exercise in the open air, without which the system must more or less languish, and growth and development be defective.

Looking now at growth, we must consider it mainly in relation to food supply. Growth may be regarded as the process of building up the animal frame with the plasma derived from the food. But as food cannot be utilized for this or any other purpose until reduced to the condition of chyle, the supply will depend upon the powers of the digestive organs as much as upon available food stuff.

After the maintenance of life and heat, the first demand upon the food taken by old or young is to supply the place

of waste consequent upon action. Any failure in this respect entails emaciation, weakness, and disease. In the adult this process of repair, along with combustion and storage of carbonaceous matter, are the only demands upon the food supply. In the young, however, over and above these immediately essential purposes, food is required to provide building material for growth, and the quantity taken requires to be to that extent greater, in proportion to size and activity, than in the adult.

Any deficiency in the food supply, or what amounts to the same thing, any excessive demand for repair consequent upon over-action, must be at the expense, in the first instance, of growth, which, having reference only to the future, is less urgent at the time,—growth must be completely starved before repair and with it health begin to suffer. What is thus true, and frequently observed with regard to the body as a whole, must be equally true of individual parts or organs which may be affected separately. These can only receive their share of the whole nutrient supply, which share, although determined to some extent by relative activity, is a limited quantity. Any excessive demand for repair must be met out of this quantum at the expense of growth and ultimate development of the part. Should nutrition be insufficient to supply even that demand, then, besides entire cessation of growth, the part will be weakened and injured.

The great importance of an adequate food supply for effective education is now being recognised, and steps taken to meet the most pressing needs. Food stands in relation to instruction as the building of a house does to the furnishing of it, and ought, one would think, to be a prior consideration.

It is very possible, however, for children to starve, as regards growth and future physique, in the midst of plenty. If the digestive powers are weak, an abundance of food is of little avail, and the child of the well-to-do may be in as poor a state as the most poverty-stricken wastral. The maintenance of a hearty appetite and good digestion ought thus to be looked upon as a first object in education, and all school procedure which tells against this is *anti-educational*.

Functional development depends upon functional activity, which, so far as it tends to development, we may call



*exercise.* Beyond that point it becomes STRAIN, and injurious to health. *Duly regulated* exercise is essential to the proper development of every part of the organism, and the ultimate attainable strength of each, in relation to organic structure, is determined by the extent to which it is thus exercised during the whole period of youth. Any part which receives no exercise (as is often the case with the muscles of the scalp and ears) is altogether lost as regards functional power, and all deficiency of exercise entails a corresponding defect in the strength of the part concerned. On the other hand, excessive exercise will produce excessive development at the expense of growth, with present increase of functional power, but ultimate organic weakness. This is seen where, as in mining districts, boys are put to hard labour. As boys these are abnormally strong, and have the appearance rather of little men. Nature, as it were, finding the strain upon the organism incompatible with the continuance at the same time of growth and health, chooses to sacrifice the former so as to save the latter. She thus hurriedly winds up her unfinished work, and adapts the young organism, as best she may, to the adult conditions imposed upon it. In such districts the men are found to be of small stature, poor physique, and short lived. What is thus demonstrated in the case of the body is equally true of the brain and mind. Any part of the mind (and there are many parts) which is insufficiently exercised in youth must be correspondingly weak in after life; while any part which is exercised to excess will be abnormally strong at the time, at the expense of growth and organic stability of the part of the brain from which it is evolved, with ultimate weakness and a tendency to early decay. It is difficult here to illustrate the effect of insufficient exercise, as such defects as would result are usually set down to individual peculiarity; but with all respect to the teaching profession, I would suggest that the restricted range of mental exercise prescribed by the school, and the comparatively little time or opportunity allowed for any other, must have the effect of narrowing the scope of mental development. The premature development consequent upon excessive mental exercise is witnessed in those young persons who work hard for school

prizes and competitive examinations. They want the brightness and animation of youth, and have an abnormally thoughtful, careworn expression of countenance,—are, in short, mentally, *little men and women*. It would not be difficult to instance numerous examples of the further analogy of later years, when the mind breaks down more or less on the very threshold of its life's work, and is worn out when it ought to be at its strongest. Such cases are probably within the experience of all medical men. They are freely cited by most with whom I have had occasion to converse on the subject, more especially in reference to the Indian Civil Service examinations. These are designed to test, not qualification for the work in prospect, but simply the powers of endurance of the candidates. They are no doubt a means of selecting those who are strongest at the time, many of the weaker breaking down under the strain of preparation; but they are also a means, according to inexorable physiological law, of preventing them from being strong in the future.

For the attainment of full power of any part, physical growth and functional development must go hand in hand, each, as it were, waiting upon the other. Exercise, while full, must use up no more than its share of plasma, *leaving the due quantum to be vested in growth for adult use*. To whatever extent this correlation of activities is departed from, so far will ultimate power come short of what it might have been.

(To be continued.)